

System Reset (with built-in watchdog timer) Monolithic IC MM1035

Outline

This IC functions in a variety of CPU systems and other logic systems to generate a reset signal and reset the system accurately during momentary interruption or lowering of power supply voltage.

It also has a built-in watchdog timer for operation diagnosis. This prevents the system from running wild by generating an intermittent reset pulse during system mis-operation.

Features

1. Built-in watchdog timer
2. Low minimum operating voltage $V_{CC}=0.8V$ typ.
3. Both positive and negative logic reset output can be extracted
4. Accurate detection of drop in power supply voltage
5. Detection voltage has hysteresis
6. Few external parts 1 capacitor

Package

DIP-8A (MM1035XD)
SOP-8A (MM1035XF)

Applications

Microcomputers


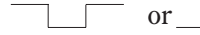


Absolute Maximum Ratings (Ta=25°C)

| Item | Symbol | Rating | Units |
|-------------------------------------|-----------------------------------|----------|-------|
| Storage temperature | T _{STG} | -40~+125 | °C |
| Operating temperature | T _{OPR} | -20~+70 | °C |
| Power supply voltage | V _{CC max.} | -0.3~+10 | V |
| Voltage applied to VS & CK pins | V _{VS} & V _{CK} | -0.3~+10 | V |
| Voltage applied to RESET, RESET pin | V _{OH} | -0.3~+10 | V |
| Allowable loss | P _d | 400 | mW |

Electrical Characteristics 1 (DC) (Except where noted otherwise, Ta=25°C, Vcc=5V, measurement circuit 1)

| Item | Symbol | Measurement circuit | Measurement conditions | Min. | Typ. | Max. | Units |
|--|--------------------|---------------------|--|------|-------|------|-------|
| Consumption current | I _{CC} | 1 | During watchdog timer operation | | 0.7 | 1.0 | mA |
| Detection voltage | V _{SL} | 1 | V _S =OPEN, V _{CC} | 4.05 | 4.20 | 4.35 | V |
| | V _{SH} | 1 | V _S =OPEN, V _{CC} | 4.15 | 4.30 | 4.45 | |
| Detection voltage temperature coefficient | V _S /ΔT | 1 | | | ±0.01 | | %/°C |
| Hysteresis voltage | V _{HYS} | 1 | V _{SH} -V _{SL} , V _{CC} | 50 | 100 | 150 | mV |
| CK input threshold | V _{TH} | 1 | | 0.8 | 1.2 | 2 | V |
| CK input current | I _{IH} | 1 | V _{CK} =5V | | 0 | 1 | μA |
| | I _{IL} | 1 | V _{CK} =0V | -20 | -10 | -3 | |
| Output voltage (High) | V _{OH1} | 1 | I _{RESET} = -5μA, V _S =OPEN | 4.5 | 4.8 | | V |
| | V _{OH2} | 1 | I _{RESET} = -5μA, V _S =0V | 4.5 | 4.8 | | |
| Output voltage (Low) | V _{OL1} | 1 | I _{RESET} = 3mA, V _S =0V | | 0.2 | 0.4 | V |
| | V _{OL2} | 1 | I _{RESET} = 10mA, V _S =0V | | 0.3 | 0.5 | |
| | V _{OL3} | 1 | I _{RESET} = 0.5mA, V _S =OPEN | | 0.2 | 0.4 | |
| | V _{OL4} | 1 | I _{RESET} = 1mA, V _S =OPEN | | 0.3 | 0.5 | |
| Output sink current | I _{OL1} | 1 | V _{RESET} = 1.0V, V _S =0V | 10 | 16 | | mA |
| | I _{OL2} | 1 | V _{RESET} = 1.0V, V _S =OPEN | 1 | 2 | | |
| C _T charge current | I _{CT1} | 1 | V _{TC} = 1.0V during watchdog timer operation | -8 | -12 | -24 | μA |
| | I _{CT2} | 1 | V _{TV} = 1.0V during power on reset operation | -0.8 | -1.2 | -2.4 | μA |
| Minimum operating power supply voltage to ensure $\overline{\text{RESET}}$ | V _{CCL1} | 1 | V _{RESET} = 0.4V I _{RESET} = 0.2mA | | 0.8 | 1.0 | V |
| Minimum operating power supply voltage to ensure $\overline{\text{RESET}}$ | V _{CCL2} | 1 | I _{RESET} = V _{CC} - 0.1V R _{L2} (between Pin 2 and GND) = 1MΩ | | 0.8 | 1.0 | V |

Electrical Characteristics 2 (AC) (Except where noted otherwise, Ta=25°C, Vcc=5V, measurement circuit 2)

| Item | Symbol | Measurement circuit | Measurement conditions | Min. | Typ. | Max. | Units |
|---|------------------|---------------------|--|------|------|------|-------|
| V _{CC} input pulse width | T _{PI} | 2 | V _{CC}  | 8 | | | μS |
| CK input pulse width | T _{CKW} | 2 | CK  or  | 3 | | | μS |
| CK input cycle | T _{CK} | 2 | | 20 | | | μS |
| Watchdog timer monitoring time *1 | T _{WD} | 2 | C _T =0.1μF | 5 | 10 | 15 | mS |
| Reset time for watchdog timer *2 | T _{WR} | 2 | C _T =0.1μF | 1 | 2 | 3 | mS |
| Reset hold time for power supply rise *3 | T _{PR} | 2 | C _T =0.1μF, V _{CC}  | 50 | 100 | 150 | mS |
| Output delay time from V _{CC} *4 | T _{PD1} | 2 | RESET pin R _{L1} =2.2kΩ, C _{L1} =100pF | | 2 | 10 | μS |
| | T _{PD2} | 2 | RESET pin R _{L2} =10kΩ, C _{L2} =20pF | | 3 | 10 | |
| Output rise time *5 | tr1 | 2 | RESET pin R _{L1} =2.2kΩ, C _{L1} =100pF | | 1.0 | 1.5 | μS |
| | tr2 | 2 | RESET pin R _{L2} =10kΩ, C _{L2} =20pF | | 1.0 | 1.5 | μS |

Notes :

- *1: Monitoring time is the time from the last pulse (negative edge) of the timer clear clock pulse, until reset pulse output. In other words, reset output is output if a clock pulse is not input during this time.
- *2: Reset time means reset pulse width. However, this does not apply to power on reset.
- *3: Reset hold time is the time from when V_{CC} exceeds detection voltage (V_{SH}) during power on reset, until RESET output goes high (reset release).
- *4: Output delay time is the time from when power supply voltage drops below detection voltage (V_{SL}), until RESET output goes low (reset status).
- *5: Voltage range when measuring output rise and fall is 10~90%.
- *6: Watchdog timer monitoring time (T_{WD}), watchdog timer reset time (T_{WR}) and reset hold time (T_{PR}) during power supply rise can be changed by varying C_T capacitance. The times are expressed by the following formulae. The recommended range for C_T is 0.001~10μF.

T_{PR} (mS) ≒ 1000 × C_T (μF)

T_{WD} (mS) ≒ 100 × C_T (μF)

T_{WR} (mS) ≒ 20 × C_T (μF)

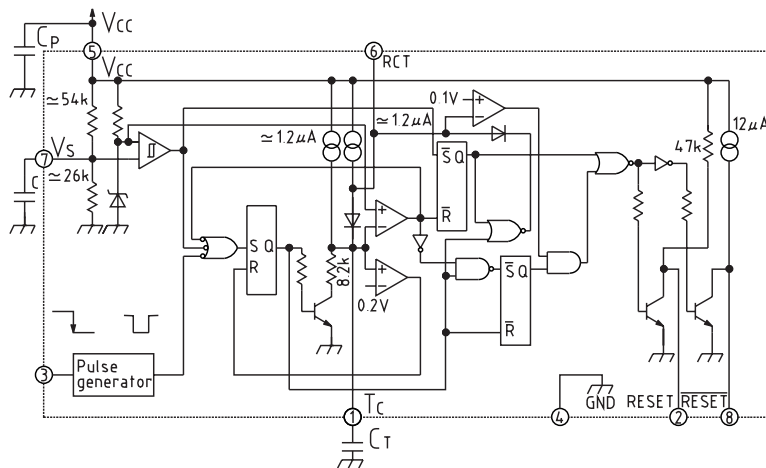
Example : When C_T=0.1μF

T_{PR} ≒ 100mS

T_{WD} ≒ 10mS

T_{WR} ≒ 2mS

Block Diagram

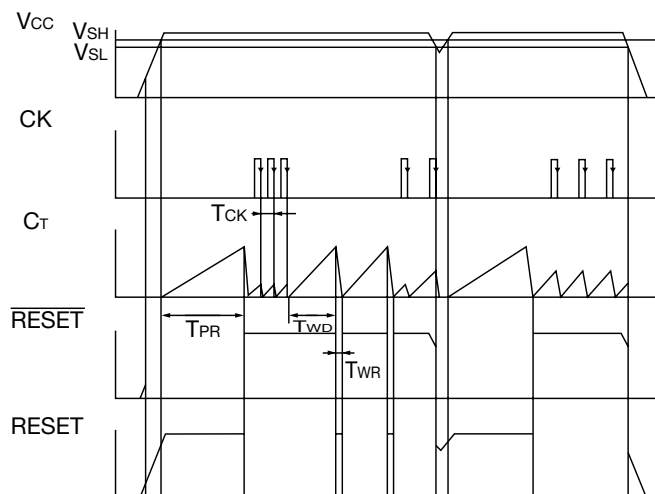


Note 1: $C_P = 0.1\mu F$ approx.

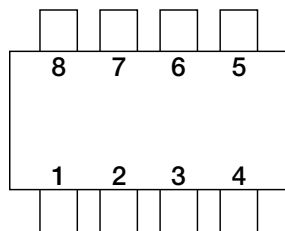
Note 2: $C_T \approx 1000pF$.

Note 3: The watchdog timer can be stopped by connecting the RCT pin to GND.
(Then it functions as a voltage detection circuit.)

Timing Chart



Pin Assignment



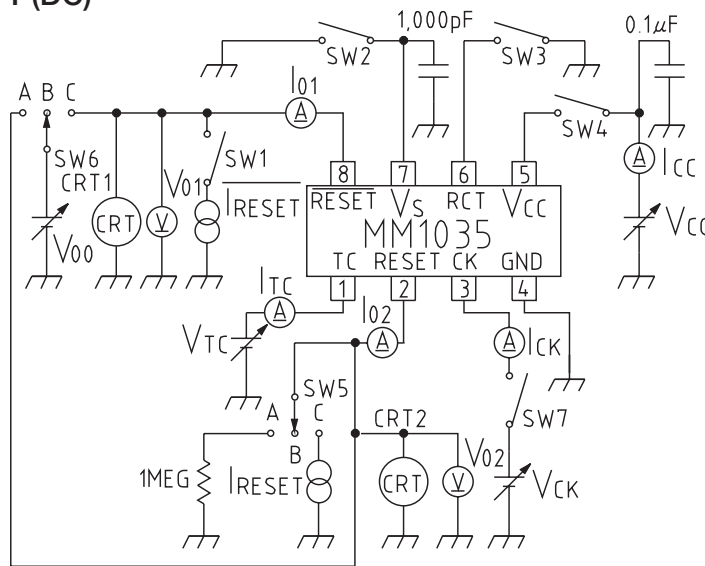
| | |
|---|-------|
| 1 | Tc |
| 2 | RESET |
| 3 | CK |
| 4 | GND |
| 5 | Vcc |
| 6 | RCT |
| 7 | Vs |
| 8 | RESET |

Pin Description

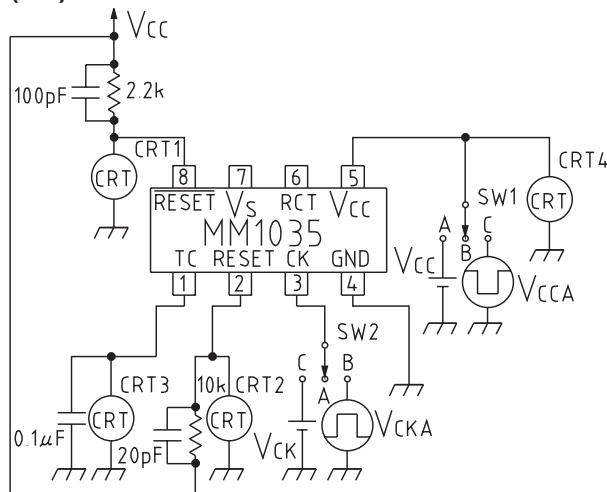
| Pin No. | Pin Name | Function |
|---------|---------------------------|--|
| 1 | T _C | T _{WD} , T _{WR} , T _{PR} variable pins. (T _{WD} , T _{WR} and T _{PR} times are determined by the external capacitor.) |
| 2 | RESET | Reset output pin (High output) |
| 3 | CK | Clock input pin (inputs clock from logic system) |
| 4 | GND | Reset output pin (High output) |
| 5 | V _{CC} | 4.2V detection voltage |
| 6 | RCT | Watchdog timer stop pin Operation modes: Operation → OPEN, Stop → connect to GND |
| 7 | V _S | Detection voltage variable pin Variation modes : Lower → pull up resistance, Raise → pull down |
| 8 | $\overline{\text{RESET}}$ | Reset output pin (Low output) |

Measuring Circuit

Measuring Circuit 1 (DC)



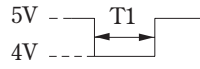
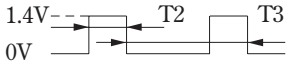
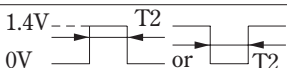
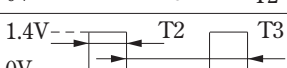
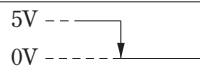
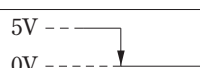
Measuring Circuit 2 (AC)



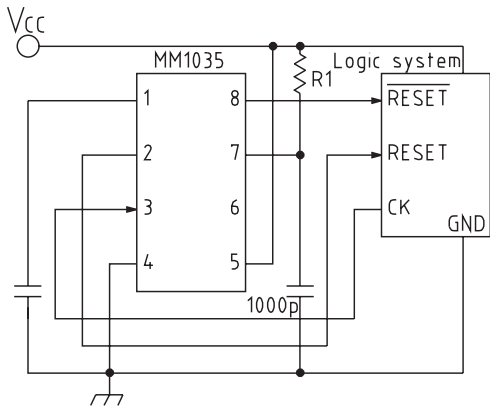
Measuring Circuit 1 SW Table 6-1-2. SW&Power Supply Table 1

| Item | Symbol | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | V _{CC} | V _{CK} | V _{CT} | I _{RESET} | I _{RESET} | VM, IM | Notes |
|--|------------------|-----|-----|-----|-----|-----|-----|-----|-----------------|-----------------|-----------------|--------------------|--------------------|-----------------------------------|---------------------|
| Consumption current | I _{CC} | OFF | OFF | OFF | ON | B | B | ON | 5V | 5V | 0V | - | - | I _{CC} | |
| Detection voltage | V _{SL} | OFF | OFF | ON | ON | B | B | ON | 5V→0V | 3V | 3V | - | - | V _{o1} , CRT1 | |
| | V _{SH} | OFF | OFF | ON | ON | B | B | ON | 4V→5V | 3V | 3V | - | - | V _{o1} , CRT1 | |
| CK input threshold | V _{TH} | OFF | OFF | OFF | ON | B | B | ON | 5V | 0V→3V | 1V | - | - | I _{CK} | |
| CK input current | I _{IH} | OFF | OFF | OFF | ON | B | B | ON | 5V | 5V | 0V | - | - | I _{CK} | |
| | I _{IL} | OFF | OFF | OFF | ON | B | B | ON | 5V | 0V | 0V | - | - | I _{CK} | |
| Output voltage (High) | V _{OH1} | ON | OFF | ON | ON | B | B | ON | 5V | 5V | 3V | -5μA | - | V _{o1} | |
| | V _{OH2} | OFF | ON | ON | ON | C | B | ON | 5V | 5V | 3V | - | -5μA | V _{o2} | |
| Output voltage (Low) | V _{OL1} | ON | ON | ON | ON | B | B | ON | 5V | 5V | 3V | 3mA | - | V _{o1} | |
| | V _{OL2} | ON | ON | ON | ON | B | B | ON | 5V | 5V | 3V | 10mA | - | V _{o1} | |
| | V _{OL3} | OFF | OFF | ON | ON | C | B | ON | 5V | 5V | 3V | - | 0.5mA | V _{o2} | |
| | V _{OL4} | OFF | OFF | ON | ON | C | B | ON | 5V | 5V | 3V | - | 1mA | V _{o2} | |
| Output sink current | I _{o1} | OFF | ON | ON | ON | B | C | ON | 5V | 5V | 3V | - | - | I _{o1} | V _{oo} =1V |
| | I _{o2} | OFF | OFF | ON | ON | B | A | ON | 5V | 5V | 3V | - | - | I _{o2} | V _{oo} =1V |
| Ct charge current 1 | I _{TC1} | OFF | OFF | OFF | ON | B | B | OFF | 5V | - | 1V | - | - | I _{TC} | |
| Ct charge current 2 | I _{TC2} | OFF | OFF | ON | ON | B | B | OFF | 5V | - | 1V | - | - | I _{TC} | |
| Minimum operating power supply voltage to ensure reset | V _{CC1} | ON | OFF | ON | ON | B | B | ON | 0V→2V | 0V | 0V | - | - | V _{o1} , V _{CC} | |
| Minimum operating power supply voltage to ensure reset | V _{CC2} | OFF | ON | ON | ON | A | B | ON | 0V→2V | 0V | 0V | - | - | V _{o2} , V _{CC} | |

Measuring Circuit 2 SW Table 6-2-2. SW&Power Supply Table 2

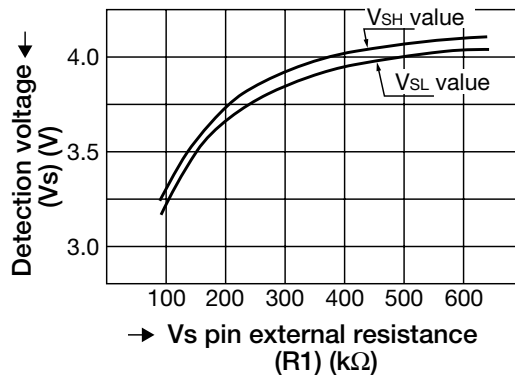
| Item | Symbol | SW1 | SW2 | V _{CCA} | V _{CC} | V _{CKA} | V _{CK} | CRT | Notes |
|--|------------------|-----|-----|---|-----------------|--|-----------------|----------|---------|
| V _{CC} input pulse width | T _{PI} | C | B |  | - |  | - | CRT1,2,3 | T1=8μS |
| CK input pulse width | T _{CKW} | A | B | | 5V |  | - | CRT1,2,3 | T2=3μS |
| CK input cycle | T _{CK} | A | B | | 5V |  | - | CRT1,2,3 | T3=20μS |
| Watchdog timer monitoring time | T _{WD} | A | A | | 5V | | 5V | CRT1,2,3 | |
| Reset time for watchdog timer | T _{WR} | A | A | | 5V | | 5V | CRT1,2,3 | |
| Reset hold time for power supply rise | T _{PR} | B→A | A | | 5V | | 5V | CRT1,2,3 | |
| Output delay time from V _{CC} | T _{PD1} | C | A |  | - | | 0V | CRT1,3 | |
| | T _{PD2} | C | A |  | - | | 0V | CRT2,3 | |
| Output rise time | T _{R1} | A | A | | 5V | | 5V | CRT1 | |
| | T _{R2} | A | A | | 5V | | 5V | CRT2 | |
| Output fall time | T _{F1} | A | A | | 5V | | 5V | CRT1 | |
| | T _{F2} | A | A | | 5V | | 5V | CRT2 | |

Detection Voltage Variation 1 (lowering detection voltage)

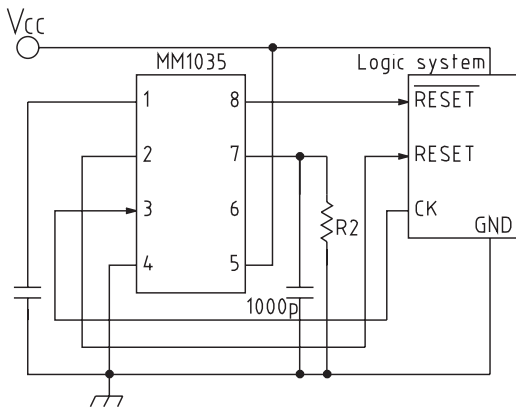


Detection voltage can be changed by connecting resistor R1 externally to MM1035 Vs pin. Determine R1 according to graph 1 when changing Vs.

Graph 1. Detection voltage change using MM1035 external resistor

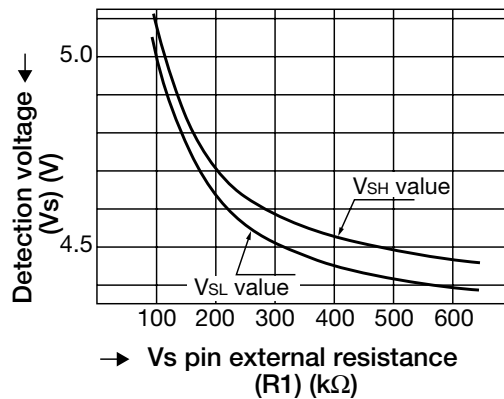


Detection Voltage Variation 2 (raising detection voltage)



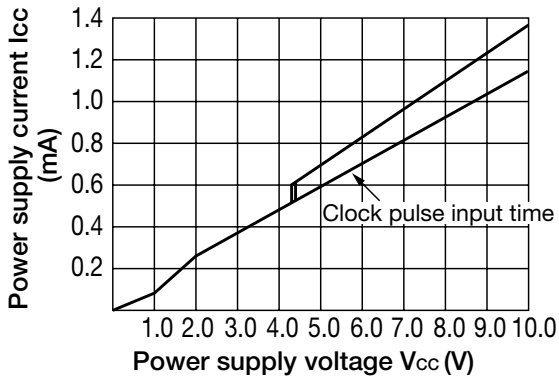
Detection voltage can be changed by connecting resistor R2 externally to MM1035 Vs pin. Determine R2 according to graph 2 when changing Vs.

Graph 2. Detection voltage change using MM1035 external resistor

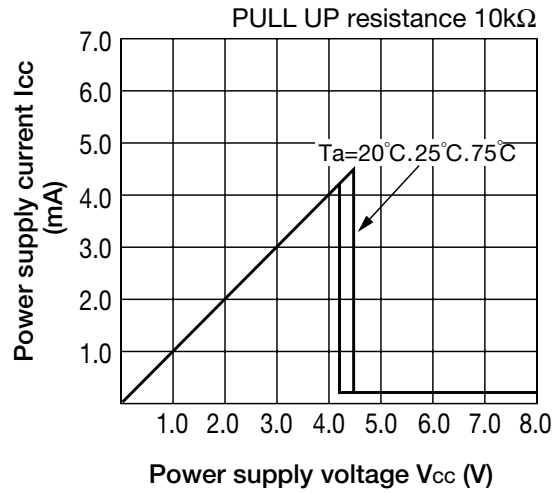


Characteristics

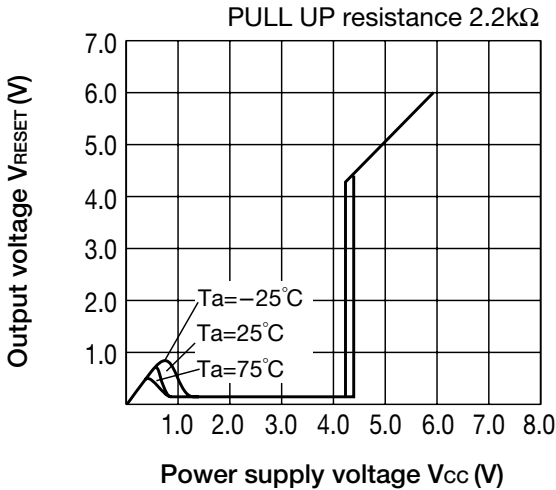
Power supply current-Power supply voltage



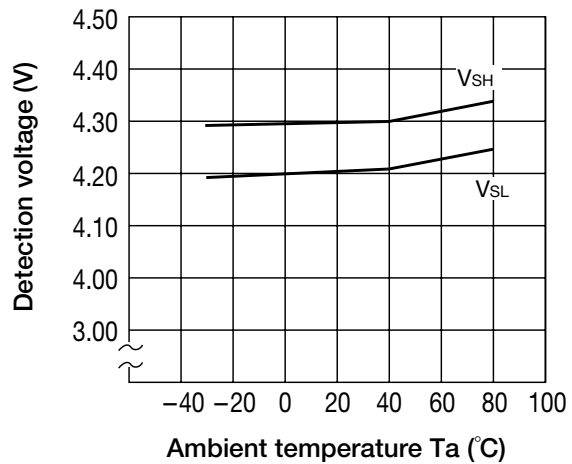
Output voltage-Power supply voltage (RESET pin)



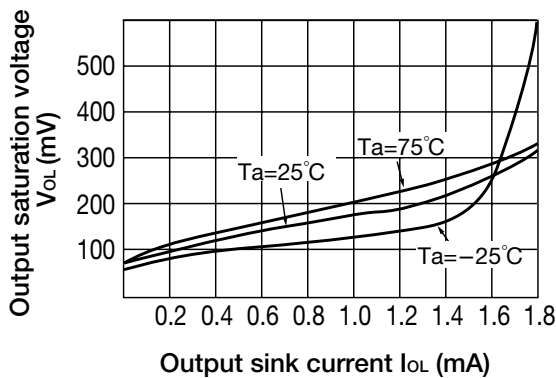
Output voltage-Power supply voltage (RESET pin)



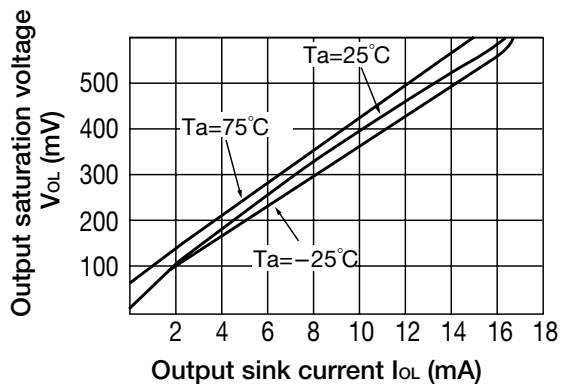
Detection voltage (VSL, VSH) temperature (RESET, RESET pins)



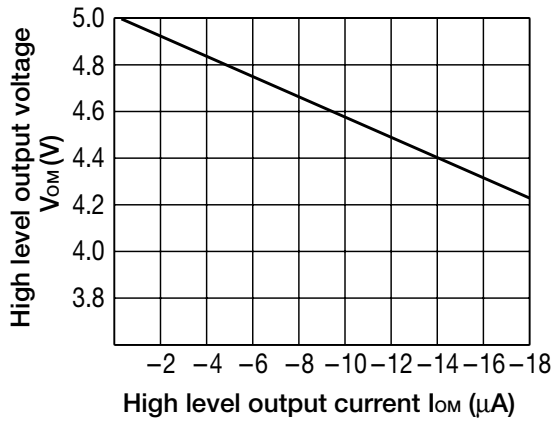
Output saturation voltage-Output sink current (RESET pin)



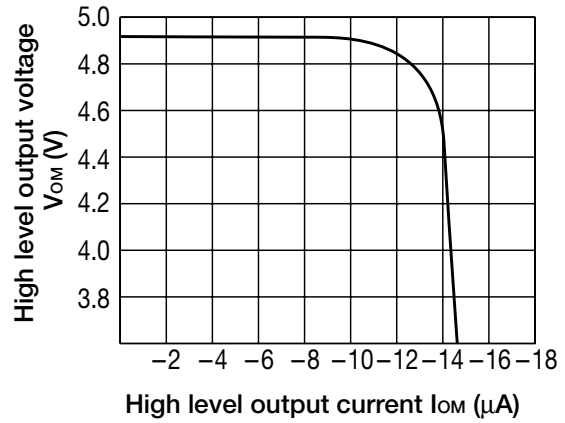
Output saturation voltage-Output sink current (RESET pin)



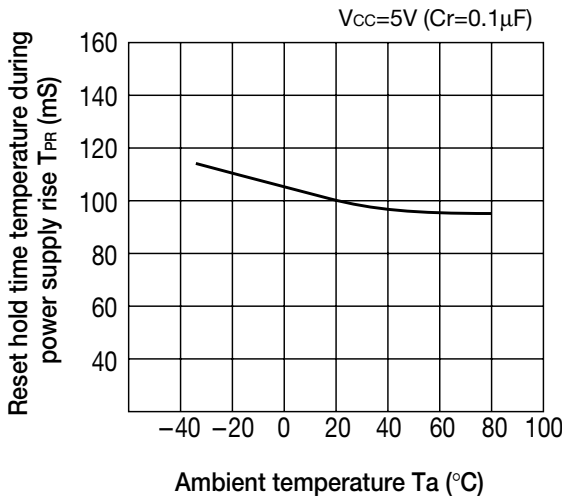
High level output voltage-High level output current (RESET pin)



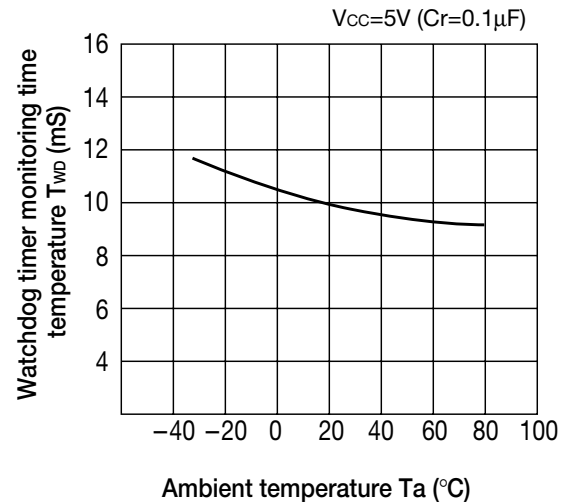
High level output voltage - High level output current (RESET pin)



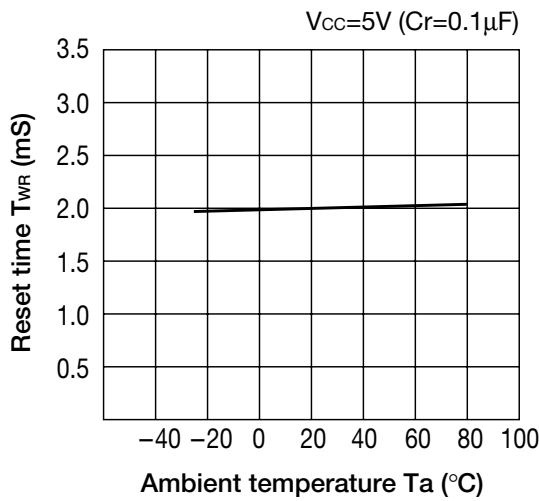
Reset hold time temperature during power supply rise



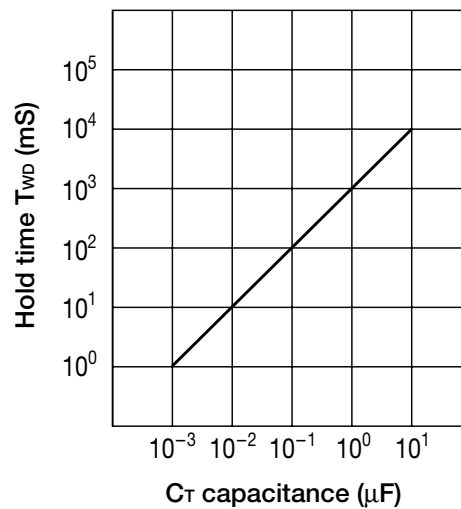
Watchdog timer monitoring time temperature



Reset time temperature (for watchdog timer)



C_T value for reset hold time during power supply rise



■ C_T value for reset time (for watchdog timer) ■ C_T value for watchdog timer monitoring time

